



CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES

This *Sample Cases* document contains three examples of cases on the Electrocardiogram (ECG) and Imaging Studies component of the Cardiovascular Disease Certification Examination. The first is an ECG case, the second is an echocardiogram case, and the third is a coronary angiogram case. Correct answers for these sample cases are discussed on pages 7-9.

Please read these instructions carefully. It is crucial to perform well on this exam.

### **Instructions**

1. It is very important to understand ahead of time how this part of the exam works, because this portion of the exam is not given as a typical multiple-choice exam. Instead, you will be asked to score your answers on an ECG, Echocardiogram, or Angiogram *answer options list*, representing a comprehensive list of findings that may be obtained on an ECG, an echocardiogram, or an angiogram. The *answer options lists* used in this Sample Cases document and in the [tutorial](#) are exactly the same lists you will use on the exam.
2. Familiarize yourself with the *answer option lists* BEFORE starting the timed exam. Although you have time allotted on test day before starting the timed section, it is highly recommended that you familiarize yourself with the *answer option lists* before test day by reading this entire document and by taking the online tutorial.
3. Each case has a patient description at the top of the *answer option list* and associated image(s). For each case, your focus should be to identify and select on the *answer options list* the findings that are apparent to you and are significant to patient management.
4. Interpret the images as you would in everyday practice. The one-line summary of the case often includes important context, so be sure to read it.
5. As in real life, a clinical diagnosis frequently is not possible without additional clinical data. You should focus on identifying those findings that are well shown on the image(s) and that you consider clinically important. The exam is not an exercise in identifying minutiae or clinically unimportant details; rather, it is an exercise in identifying those findings that are clearly apparent and significant to patient management.
6. Correct answers for some cases will include options from several sections; within a section, it may be appropriate to select more than one option. However, a selection of options from all sections is not required for each case. Your score for each case depends on selection of the option(s) that correctly describe(s) the findings. A correct selection may be invalidated by 1) selecting options that could lead to an incorrect interpretation, or 2) coding for conflicting answers. For example, if you code sinus rhythm and atrial fibrillation for the same ECG, you will get the point wrong even if the ECG shows atrial fibrillation.
7. If there is gray area or redundancy in answer possibilities, then the exam committee will have set the answer key to accept the possibilities on either side of the gray area. For example, an echocardiogram showing LV dilation and severely reduced EF will likely give full credit for a combination of (“enlarged LV” AND “severely reduced EF”) or simply “dilated cardiomyopathy.” If you code for all three you of course also get credit.
8. For the ECGs, it is true that an ECG alone is often inadequate to make a clinical disorder diagnosis with certainty. For the listed Clinical Disorders on the answer key, choosing one is equivalent to writing on the ECG to “Consider” this clinical diagnosis.

**Note: This document contains only still-frame images; however, the actual Imaging Studies component of the exam and the [Exam Tutorial](#) contain moving images. In addition, the answer options in this document are not selectable. The online tutorial will have full functionality that will be similar to what you will see on the actual exam. It is recommended that you go through the online tutorial and practice with the actual *answer option lists*.**

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**SAMPLE CASE**

**Electrocardiogram:**

The Electrocardiogram (ECG) section of the Cardiovascular Disease Certification examination is designed to test your ability to interpret electrocardiograms.

This page shows a patient description and the Figure/Media, which appear at the top of the comprehensive list of answer options you will see with each ECG case. The answer options are grouped in the following sections: General Features and P Wave Abnormalities; Rhythms; AV Conduction; Voltage or Axis/Hypertrophy; Intraventricular Conduction; Myocardial Infarction; ST, T, U Wave Abnormalities; Clinical Disorders; and Pacemaker Function.

Read the patient description and review the Figure/Media to interpret the image, identifying any abnormalities. Select the appropriate answer option(s) that correspond to your findings.

Correct answers for some cases may include choices from several sections; within a section, it may be appropriate to select more than one option. However, a selection of answer options from all sections is not required for each case.

The goal is not to identify every normal finding, nor is this an exercise in identifying minutiae or clinically unimportant details. If you believe there is insufficient data or evidence for a feature or an abnormality, make no selection(s) in that section.



**ECG Sample Case: A 60-year-old woman undergoing evaluation prior to cholecystectomy**

**Figure/Media**

<p><b>GENERAL FEATURES &amp; P WAVE ABNORMALITIES</b></p> <p><b>General Features</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Normal ECG</li> <li><input type="checkbox"/> Normal variant</li> <li><input type="checkbox"/> Incorrect electrode placement</li> <li><input type="checkbox"/> Artifact</li> </ul> <p><b>P Wave Abnormalities</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Right atrial abnormality/enlargement</li> <li><input type="checkbox"/> Left atrial abnormality/enlargement</li> </ul>	<p><b>ATRIOVENTRICULAR CONDUCTION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> AV block, 1°</li> <li><input type="checkbox"/> AV block, 2° - Mobitz type I (Wenckebach)</li> <li><input type="checkbox"/> AV block, 2° - Mobitz type II</li> <li><input type="checkbox"/> AV block, 2:1</li> <li><input type="checkbox"/> AV block, 3°</li> <li><input type="checkbox"/> Wolff-Parkinson-White pattern</li> <li><input type="checkbox"/> AV dissociation</li> </ul>	<p><b>INTRAVENTRICULAR CONDUCTION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> RBBB, complete</li> <li><input type="checkbox"/> RBBB, incomplete</li> <li><input type="checkbox"/> Left anterior fascicular block</li> <li><input type="checkbox"/> Left posterior fascicular block</li> <li><input type="checkbox"/> LBBB, complete</li> <li><input type="checkbox"/> LBBB, incomplete</li> <li><input type="checkbox"/> Aberrant conduction (including rate-related)</li> <li><input type="checkbox"/> Intraventricular conduction disturbance, nonspecific type</li> </ul>																		
<p><b>RHYTHMS</b></p> <p><b>Atrial Rhythms</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Sinus rhythm</li> <li><input type="checkbox"/> Sinus arrhythmia</li> <li><input type="checkbox"/> Sinus bradycardia (&lt;60)</li> <li><input type="checkbox"/> Sinus tachycardia (&gt;100)</li> <li><input type="checkbox"/> Sinus pause or arrest</li> <li><input type="checkbox"/> Sinoatrial exit block</li> <li><input type="checkbox"/> Atrial premature complexes</li> <li><input type="checkbox"/> Atrial tachycardia</li> <li><input type="checkbox"/> Atrial tachycardia, multifocal</li> <li><input type="checkbox"/> Supraventricular tachycardia</li> <li><input type="checkbox"/> Atrial flutter</li> <li><input type="checkbox"/> Atrial fibrillation</li> </ul> <p><b>AV Junctional Rhythms</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> AV junctional premature complexes</li> <li><input type="checkbox"/> AV junctional escape complexes</li> <li><input type="checkbox"/> AV junctional rhythm/tachycardia</li> </ul> <p><b>Ventricular Rhythms</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ventricular premature complex(es)</li> <li><input type="checkbox"/> Ventricular parasystole</li> <li><input type="checkbox"/> Ventricular tachycardia (3 or more consecutive complexes)</li> <li><input type="checkbox"/> Accelerated idioventricular rhythm</li> <li><input type="checkbox"/> Ventricular escape complexes or rhythm</li> <li><input type="checkbox"/> Ventricular fibrillation</li> </ul>	<p><b>VOLTAGE OR AXIS/HYPERTROPHY</b></p> <p><b>Abnormal QRS Voltage or Axis</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Low voltage, limb leads</li> <li><input type="checkbox"/> Low voltage, precordial leads</li> <li><input type="checkbox"/> Left axis deviation (&gt; -30°)</li> <li><input type="checkbox"/> Right axis deviation (&gt; +100°)</li> <li><input type="checkbox"/> Electrical alternans</li> </ul> <p><b>Ventricular Hypertrophy</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Left ventricular hypertrophy</li> <li><input type="checkbox"/> Right ventricular hypertrophy</li> <li><input type="checkbox"/> Combined ventricular hypertrophy</li> </ul>	<p><b>MYOCARDIAL INFARCTION</b></p> <table border="1"> <thead> <tr> <th></th> <th>Age recent, or probably acute</th> <th>Age indeterminate, or probably old</th> </tr> </thead> <tbody> <tr> <td>Anterolateral</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Anterior or anteroseptal</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Lateral</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Inferior</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Posterior</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		Age recent, or probably acute	Age indeterminate, or probably old	Anterolateral	<input type="checkbox"/>	<input type="checkbox"/>	Anterior or anteroseptal	<input type="checkbox"/>	<input type="checkbox"/>	Lateral	<input type="checkbox"/>	<input type="checkbox"/>	Inferior	<input type="checkbox"/>	<input type="checkbox"/>	Posterior	<input type="checkbox"/>	<input type="checkbox"/>
	Age recent, or probably acute	Age indeterminate, or probably old																		
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Anterior or anteroseptal	<input type="checkbox"/>	<input type="checkbox"/>																		
Lateral	<input type="checkbox"/>	<input type="checkbox"/>																		
Inferior	<input type="checkbox"/>	<input type="checkbox"/>																		
Posterior	<input type="checkbox"/>	<input type="checkbox"/>																		
<p><b>CLINICAL DISORDERS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Brugada syndrome</li> <li><input type="checkbox"/> Digitalis toxicity</li> <li><input type="checkbox"/> Torsades de pointes</li> <li><input type="checkbox"/> Hyperkalemia</li> <li><input type="checkbox"/> Hypokalemia</li> <li><input type="checkbox"/> Hypercalcemia</li> <li><input type="checkbox"/> Hypocalcemia</li> <li><input type="checkbox"/> Dextrocardia, mirror image</li> <li><input type="checkbox"/> Acute cor pulmonale including pulmonary embolus</li> <li><input type="checkbox"/> Pericardial effusion</li> <li><input type="checkbox"/> Acute pericarditis</li> <li><input type="checkbox"/> Hypertrophic cardiomyopathy</li> <li><input type="checkbox"/> Central nervous system disorder</li> <li><input type="checkbox"/> Hypothermia</li> </ul>	<p><b>ST, T, U WAVE ABNORMALITIES</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Normal variant, early repolarization</li> <li><input type="checkbox"/> Normal variant, juvenile T waves</li> <li><input type="checkbox"/> Nonspecific ST and/or T wave abnormalities</li> <li><input type="checkbox"/> ST and/or T wave abnormalities suggesting myocardial ischemia</li> <li><input type="checkbox"/> ST and/or T wave abnormalities suggesting myocardial injury</li> <li><input type="checkbox"/> ST and/or T wave abnormalities suggesting electrolyte disturbances</li> <li><input type="checkbox"/> ST and/or T wave abnormalities secondary to hypertrophy</li> <li><input type="checkbox"/> Prolonged Q-T interval</li> <li><input type="checkbox"/> Prominent U waves</li> </ul>	<p><b>PACEMAKER FUNCTION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Atrial or coronary sinus pacing</li> <li><input type="checkbox"/> Ventricular demand pacemaker (VVI), normally functioning</li> <li><input type="checkbox"/> Dual-chamber pacemaker (DDD), normally functioning</li> <li><input type="checkbox"/> Pacemaker malfunction, not constantly capturing (atrium or ventricle)</li> <li><input type="checkbox"/> Pacemaker malfunction, not constantly sensing (atrium or ventricle)</li> <li><input type="checkbox"/> Paced morphology consistent with biventricular pacing or cardiac resynchronization therapy</li> </ul>																		

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**SAMPLE CASE**

**Echocardiogram:**

The Echocardiogram portion of the Imaging Studies section of the examination is designed to test your ability to interpret echocardiograms.

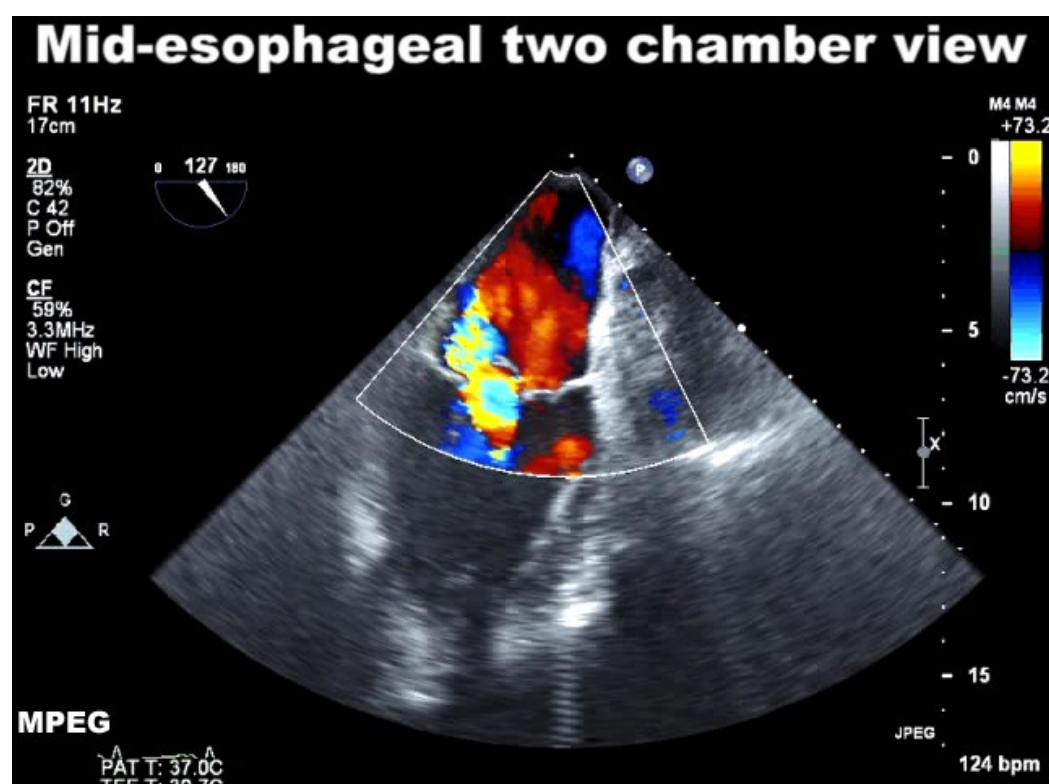
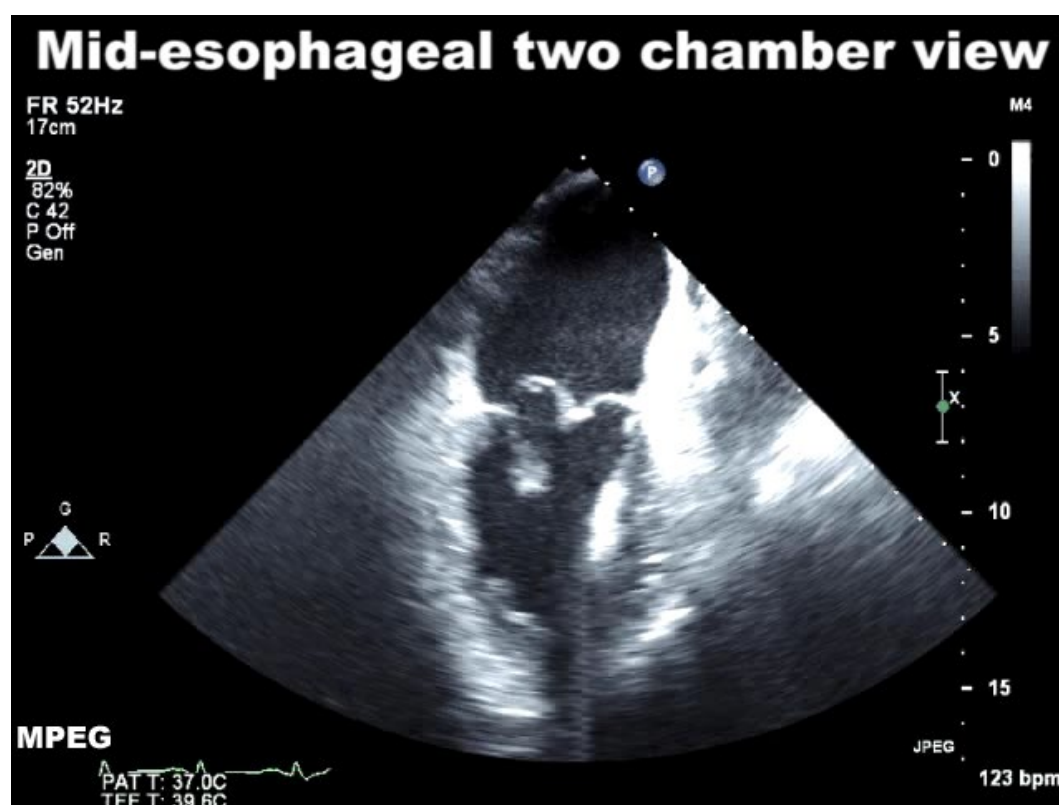
This page and page 4 show a patient description and the Figure/Media, which appear at the top of a comprehensive list of answer options with each echocardiogram case. The answer options are grouped in the following sections: Left Ventricle; Right Ventricle; Atria; Valvular Heart Disease; Cardiomyopathy and Systemic Disease; Pulmonary/Aorta; Pericardial/Pleural Diseases; and Congenital Heart Disease.

Read the patient description and review the Figure/Media to interpret the images, identifying any abnormalities. Select the appropriate answer option(s) that correspond to your findings.

Correct answers for some cases may include choices from several sections; within a section, it may be appropriate to select more than one option. However, a selection of answer options from all sections is not required for each case.

The goal is not to identify every normal finding, nor is this an exercise in identifying minutiae or clinically unimportant details. If you believe there is insufficient data or evidence for a feature or an abnormality, make no selection(s) in that section.

All modalities of transthoracic and transesophageal echocardiograms may be presented, and all views will be appropriately labeled. On occasion, off-axis or unusual views may be used to highlight a relevant pathology or finding. Vertical markings on M-mode frames represent 1-cm increments; however, precise measurements are not required.



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**Echocardiogram Sample Case: A 63-year-old man with pulmonary edema and chest pain**

Figure/Media

<b>LEFT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE</b>				<b>RIGHT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE</b>		<b>DISEASES OF THE ATRIA</b>			
<b>LV Size</b> <input type="checkbox"/> Normal <input type="checkbox"/> Enlarged <input type="checkbox"/> Small	<b>LV Infarct Complications</b> <input type="checkbox"/> Ventricular septal rupture <input type="checkbox"/> Free wall rupture <input type="checkbox"/> Ruptured papillary muscle	<b>LV Wall Thickness</b> <input type="checkbox"/> Normal <input type="checkbox"/> Concentric increase <input type="checkbox"/> Asymmetric septal hypertrophy	<b>LV Masses</b> <input type="checkbox"/> LV mass or thrombus <input type="checkbox"/> Metastatic tumor	<input type="checkbox"/> Enlarged RV <input type="checkbox"/> RV infarct <input type="checkbox"/> Global hypokinesis <input type="checkbox"/> RV volume overload <input type="checkbox"/> RV pressure overload <input type="checkbox"/> Catheter or pacemaker wire <input type="checkbox"/> RV mass or thrombus	<input type="checkbox"/> Enlarged left atrium <input type="checkbox"/> Enlarged right atrium <input type="checkbox"/> Atrial myxoma <input type="checkbox"/> Atrial thrombus <input type="checkbox"/> Metastatic tumor <input type="checkbox"/> Atrial septal lipomatous hypertrophy	<b>PERICARDIAL AND PLEURAL DISEASES</b>			
<b>LV Diastolic Function</b> <input type="checkbox"/> Normal <input type="checkbox"/> Grade 1 (abnormal relaxation) <input type="checkbox"/> Grade 2 (pseudonormal) <input type="checkbox"/> Grade 3 (restrictive)	<b>LV Ejection Fraction</b> <input type="checkbox"/> Normal to hyperdynamic (>=50%) <input type="checkbox"/> Mild to moderately reduced (35-49%) <input type="checkbox"/> Severely reduced (<35%)	<b>Regional Wall Motion Abnormalities</b> <input type="checkbox"/> Abnormal wall motion <input type="checkbox"/> Global hypokinesis		<b>TYPES OF CARDIOMYOPATHY</b> <input type="checkbox"/> Hypertrophic <input type="checkbox"/> Apical hypertrophic <input type="checkbox"/> Restrictive <input type="checkbox"/> ARVD <input type="checkbox"/> Dilated <input type="checkbox"/> Noncompaction <input type="checkbox"/> Takotsubo (stress induced)		<input type="checkbox"/> Pericardial effusion without tamponade <input type="checkbox"/> Tamponade <input type="checkbox"/> Pericardial mass or hemopericardium <input type="checkbox"/> Pericardial constriction <input type="checkbox"/> Pericardial cyst <input type="checkbox"/> Pleural effusion			
<b>VALVULAR HEART DISEASE</b>				<b>SYSTEMIC DISEASE</b>		<b>CONGENITAL HEART DISEASE</b>			
<b>Structure</b> <b>Mitral Valve</b> <input type="checkbox"/> Calcified <input type="checkbox"/> Rheumatic <input type="checkbox"/> Cleft <input type="checkbox"/> Vegetation <input type="checkbox"/> Prolapse <input type="checkbox"/> Flail <input type="checkbox"/> Fibroelastoma <input type="checkbox"/> Systolic anterior motion (SAM) <b>Pulmonic Valve</b> <input type="checkbox"/> Congenitally abnormal <input type="checkbox"/> Carcinoid				<b>Aortic Valve</b> <input type="checkbox"/> Calcified <input type="checkbox"/> Rheumatic <input type="checkbox"/> Bicuspid <input type="checkbox"/> Vegetation <input type="checkbox"/> Flail <input type="checkbox"/> Fibroelastoma <input type="checkbox"/> Abscess <b>Tricuspid Valve</b> <input type="checkbox"/> Fails to coapt <input type="checkbox"/> Carcinoid <input type="checkbox"/> Vegetation <input type="checkbox"/> Prolapse <input type="checkbox"/> Flail		<input type="checkbox"/> Amyloid <input type="checkbox"/> Hypereosinophilia		<input type="checkbox"/> Patent foramen ovale <input type="checkbox"/> Primum ASD <input type="checkbox"/> Secundum ASD <input type="checkbox"/> Sinus venosus ASD <input type="checkbox"/> Muscular VSD <input type="checkbox"/> Membranous VSD <input type="checkbox"/> Supracristal VSD <input type="checkbox"/> Patent ductus arteriosus <input type="checkbox"/> Subaortic stenosis <input type="checkbox"/> Anomalous coronary artery <input type="checkbox"/> Coronary fistula <input type="checkbox"/> Tetralogy of Fallot <input type="checkbox"/> Ebstein's anomaly <input type="checkbox"/> Complete transposition (D-TGA) <input type="checkbox"/> Corrected transposition (L-TGA)	
<b>Function</b>				<b>PULMONARY DISEASE</b>		<b>DISEASES OF THE AORTA</b>			
<input type="checkbox"/> Mild/ Moderate Severe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
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**CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES**

**SAMPLE CASE**

**Angiogram:**

The Angiogram portion of the Imaging Studies section of the examination is designed to test your ability to interpret coronary angiograms.

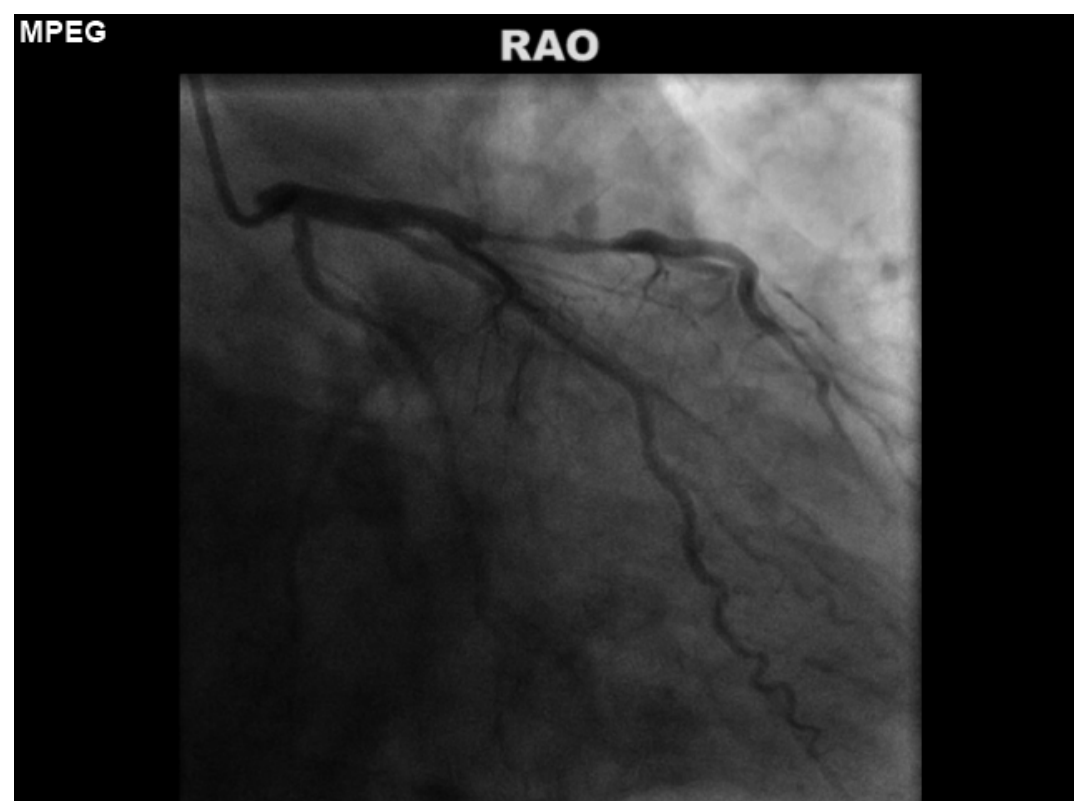
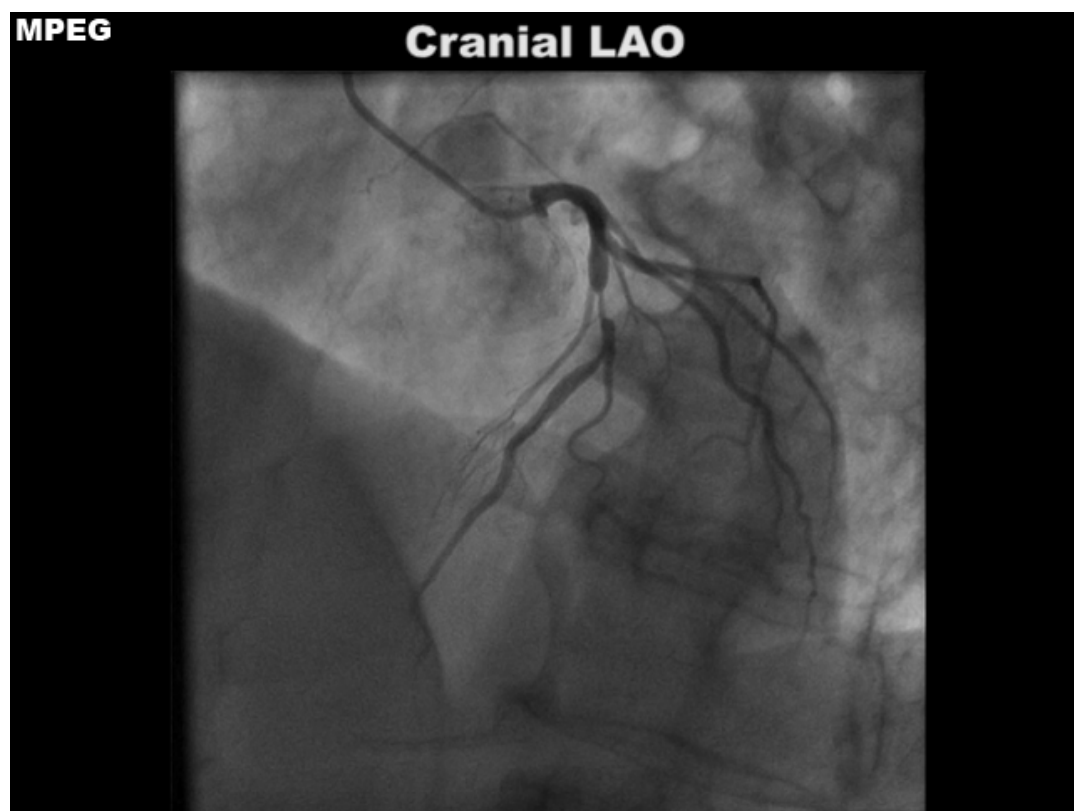
This page and page 6 show a patient description and the Figure/Media, which appear at the top of a comprehensive list of answer options with each angiogram case. The option list is divided into five (5) columns corresponding to the coronary arteries and to bypass grafts: Left main, Left anterior descending, Left circumflex, Right, and Bypass graft. The option list also includes selections for stents (both patent and occluded).

For each diseased vessel shown in a case, you must indicate the degree of the most severe stenosis. If an intracoronary thrombus is present, include the thrombus in your assessment of the degree of stenosis. Correct answers also may include options for other findings.

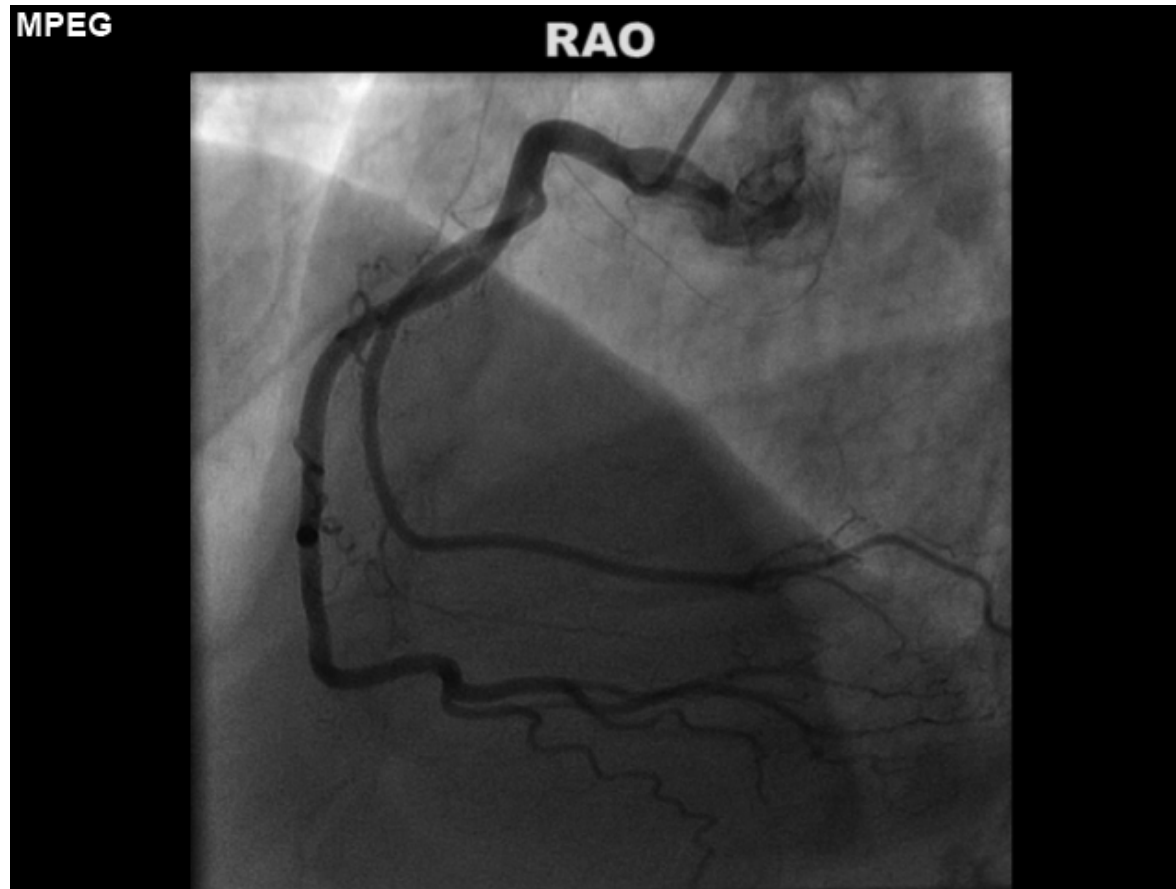
Read the patient description and review the Figure/Media to interpret the image(s), identifying any abnormalities. Select the appropriate answer option(s) that correspond to your findings.

Correct answers for some cases may include options from several columns; however, a selection of answer options from all columns is not required for each case.

**NOTE:** If you select the answer option labeled "Normal" for a case, select no other options.



**CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES**



**Angiogram Sample Case: A 50-year-old man who has chest pain with minimal exertion**

Figure/Media

**NOTE: You must select a description for the degree of the most severe stenosis in each diseased vessel shown.**

Normal

	Left main	Left anterior descending	Left circumflex	Right	Bypass graft
Fixed stenosis:					
Insignificant stenosis (<50% diameter reduction)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moderate stenosis (50 to 75% diameter reduction)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe stenosis (>75% diameter reduction)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total occlusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Filled by collaterals		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spasm		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thrombus present		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Myocardial bridge		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Anomalous origin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Coronary fistula	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Aneurysm/Severe ectasia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bypass graft to (indicate observed anatomical connection)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Dissection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stent: patent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stent: occluded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES**

**SCORING OF SAMPLE CASES**

**Electrocardiogram:** The correct two selections for this case are sinus rhythm (found in the Rhythms section) AND Wolff-Parkinson-White pattern (found in the AV Conduction section). You must select both answer choices to receive a correct score for this case. If you selected lateral myocardial infarction (because of the Q waves in leads I and L), you would lose the WPW point, because those Q waves are actually delta waves and are not diagnostic of an MI in this setting (i.e., the answer of WPW pattern is contradictory to the lateral MI answer). If you coded for “left atrial abnormality/enlargement” you would neither gain nor lose a point, as this is not clearly enough present that coding it was necessary (but it is not wrong either). Below is the appearance of the option list with the correct answers.

**ECG Sample Case: A 60-year-old woman undergoing evaluation prior to cholecystectomy**

Figure/Media

<p><b>GENERAL FEATURES &amp; P WAVE ABNORMALITIES</b></p> <p><b>General Features</b></p> <input type="checkbox"/> Normal ECG <input type="checkbox"/> Normal variant <input type="checkbox"/> Incorrect electrode placement <input type="checkbox"/> Artifact <p><b>P Wave Abnormalities</b></p> <input type="checkbox"/> Right atrial abnormality/enlargement <input type="checkbox"/> Left atrial abnormality/enlargement	<p><b>ATRIOVENTRICULAR CONDUCTION</b></p> <input type="checkbox"/> AV block, 1° <input type="checkbox"/> AV block, 2° - Mobitz type I (Wenckebach) <input type="checkbox"/> AV block, 2° - Mobitz type II <input type="checkbox"/> AV block, 2:1 <input checked="" type="checkbox"/> AV block, 3° <input checked="" type="checkbox"/> Wolff-Parkinson-White pattern <input type="checkbox"/> AV dissociation	<p><b>INTRAVENTRICULAR CONDUCTION</b></p> <input type="checkbox"/> RBBB, complete <input type="checkbox"/> RBBB, incomplete <input type="checkbox"/> Left anterior fascicular block <input type="checkbox"/> Left posterior fascicular block <input type="checkbox"/> LBBB, complete <input type="checkbox"/> LBBB, incomplete <input type="checkbox"/> Aberrant conduction (including rate-related) <input type="checkbox"/> Intraventricular conduction disturbance, nonspecific type	<p><b>RHYTHMS</b></p> <p><b>Atrial Rhythms</b></p> <input checked="" type="checkbox"/> Sinus rhythm <input type="checkbox"/> Sinus arrhythmia <input type="checkbox"/> Sinus bradycardia (<60) <input type="checkbox"/> Sinus tachycardia (>100) <input type="checkbox"/> Sinus pause or arrest <input type="checkbox"/> Sinoatrial exit block <input type="checkbox"/> Atrial premature complexes <input type="checkbox"/> Atrial tachycardia <input type="checkbox"/> Atrial tachycardia, multifocal <input type="checkbox"/> Supraventricular tachycardia <input type="checkbox"/> Atrial flutter <input type="checkbox"/> Atrial fibrillation <p><b>AV Junctional Rhythms</b></p> <input type="checkbox"/> AV junctional premature complexes <input type="checkbox"/> AV junctional escape complexes <input type="checkbox"/> AV junctional rhythm/tachycardia <p><b>Ventricular Rhythms</b></p> <input type="checkbox"/> Ventricular premature complex(es) <input type="checkbox"/> Ventricular parasystole <input type="checkbox"/> Ventricular tachycardia (3 or more consecutive complexes) <input type="checkbox"/> Accelerated idioventricular rhythm <input type="checkbox"/> Ventricular escape complexes or rhythm <input type="checkbox"/> Ventricular fibrillation																		
<p><b>VOLTAGE OR AXIS/HYPERTROPHY</b></p> <p><b>Abnormal QRS Voltage or Axis</b></p> <input type="checkbox"/> Low voltage, limb leads <input type="checkbox"/> Low voltage, precordial leads <input type="checkbox"/> Left axis deviation (> -30°) <input type="checkbox"/> Right axis deviation (> +100°) <input type="checkbox"/> Electrical alternans <p><b>Ventricular Hypertrophy</b></p> <input type="checkbox"/> Left ventricular hypertrophy <input type="checkbox"/> Right ventricular hypertrophy <input type="checkbox"/> Combined ventricular hypertrophy		<p><b>MYOCARDIAL INFARCTION</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">Age recent, or probably acute</th> <th style="width: 20%; text-align: center;">Age indeterminate, or probably old</th> </tr> </thead> <tbody> <tr> <td><b>Anterolateral</b></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><b>Anterior or anteroseptal</b></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><b>Lateral</b></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><b>Inferior</b></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><b>Posterior</b></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>			Age recent, or probably acute	Age indeterminate, or probably old	<b>Anterolateral</b>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Anterior or anteroseptal</b>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Lateral</b>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Inferior</b>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Posterior</b>	<input type="checkbox"/>	<input type="checkbox"/>
	Age recent, or probably acute	Age indeterminate, or probably old																			
<b>Anterolateral</b>	<input type="checkbox"/>	<input type="checkbox"/>																			
<b>Anterior or anteroseptal</b>	<input type="checkbox"/>	<input type="checkbox"/>																			
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<b>Inferior</b>	<input type="checkbox"/>	<input type="checkbox"/>																			
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<p><b>CLINICAL DISORDERS</b></p> <input type="checkbox"/> Brugada syndrome <input type="checkbox"/> Digitalis toxicity <input type="checkbox"/> Torsades de pointes <input type="checkbox"/> Hyperkalemia <input type="checkbox"/> Hypokalemia <input type="checkbox"/> Hypercalcemia <input type="checkbox"/> Hypocalcemia <input type="checkbox"/> Dextrocardia, mirror image <input type="checkbox"/> Acute cor pulmonale including pulmonary embolus <input type="checkbox"/> Pericardial effusion <input type="checkbox"/> Acute pericarditis <input type="checkbox"/> Hypertrophic cardiomyopathy <input type="checkbox"/> Central nervous system disorder <input type="checkbox"/> Hypothermia		<p><b>ST, T, U WAVE ABNORMALITIES</b></p> <input type="checkbox"/> Normal variant, early repolarization <input type="checkbox"/> Normal variant, juvenile T waves <input type="checkbox"/> Nonspecific ST and/or T wave abnormalities <input type="checkbox"/> ST and/or T wave abnormalities suggesting myocardial ischemia <input type="checkbox"/> ST and/or T wave abnormalities suggesting myocardial injury <input type="checkbox"/> ST and/or T wave abnormalities suggesting electrolyte disturbances <input type="checkbox"/> ST and/or T wave abnormalities secondary to hypertrophy <input type="checkbox"/> Prolonged Q-T interval <input type="checkbox"/> Prominent U waves																			
<p><b>PACEMAKER FUNCTION</b></p> <input type="checkbox"/> Atrial or coronary sinus pacing <input type="checkbox"/> Ventricular demand pacemaker (VVI), normally functioning <input type="checkbox"/> Dual-chamber pacemaker (DDD), normally functioning <input type="checkbox"/> Pacemaker malfunction, not constantly capturing (atrium or ventricle) <input type="checkbox"/> Pacemaker malfunction, not constantly sensing (atrium or ventricle) <input type="checkbox"/> Paced morphology consistent with biventricular pacing or cardiac resynchronization therapy																					

**CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES**

**SCORING OF SAMPLE CASES**

**Echocardiogram:** This example is from a transesophageal echo with three included images. The correct answer for this case is ruptured papillary muscle [found in the Left Ventricle section]. Selecting mitral valve vegetation [found in the Valvular Heart Disease section] would invalidate your answer. You would receive a second point for selecting inferior/posterior hypokinesia OR inferior/posterior akinesia [found in the Left Ventricle section]. You would receive a third point for selecting enlarged left atrium [found in the Atria section] AND severe mitral valve regurgitation [found in the Valvular Heart Disease section]. You would neither gain nor lose a point for selecting “flail” mitral valve, as this is redundant with ruptured papillary muscle. Although it is challenging to fully assess the mitral regurgitation in just one Doppler image, the degree of flail suggests it would be severe regurgitation, and there is the additional context that the patient has pulmonary edema and chest pain. Below is the appearance of the option list with the correct answers selected.

**Echocardiogram Sample Case: A 63-year-old man with pulmonary edema and chest pain**

Figure/Media

<b>LEFT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE</b>					<b>RIGHT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE</b>		<b>DISEASES OF THE ATRIA</b>																																																	
<b>LV Size</b> <input type="checkbox"/> Normal <input type="checkbox"/> Enlarged <input type="checkbox"/> Small	<b>LV Infarct Complications</b> <input type="checkbox"/> Ventricular septal rupture <input type="checkbox"/> Free wall rupture <input checked="" type="checkbox"/> Ruptured papillary muscle	<b>LV Wall Thickness</b> <input type="checkbox"/> Normal <input type="checkbox"/> Concentric increase <input type="checkbox"/> Asymmetric septal hypertrophy	<b>LV Masses</b> <input type="checkbox"/> LV mass or thrombus <input type="checkbox"/> Metastatic tumor		<input type="checkbox"/> Enlarged RV <input type="checkbox"/> RV infarct <input type="checkbox"/> Global hypokinesia <input type="checkbox"/> RV volume overload <input type="checkbox"/> RV pressure overload <input type="checkbox"/> Catheter or pacemaker wire <input type="checkbox"/> RV mass or thrombus	<input checked="" type="checkbox"/> Enlarged left atrium <input type="checkbox"/> Enlarged right atrium <input type="checkbox"/> Atrial myxoma <input type="checkbox"/> Atrial thrombus <input type="checkbox"/> Metastatic tumor <input type="checkbox"/> Atrial septal lipomatous hypertrophy																																																		
<b>LV Diastolic Function</b> <input type="checkbox"/> Normal <input type="checkbox"/> Grade 1 (abnormal relaxation) <input type="checkbox"/> Grade 2 (pseudonormal) <input type="checkbox"/> Grade 3 (restrictive)	<b>LV Ejection Fraction</b> <input type="checkbox"/> Normal to hyperdynamic (>=50%) <input type="checkbox"/> Mild to moderately reduced (35-49%) <input type="checkbox"/> Severely reduced (<35%)	<b>Regional Wall Motion Abnormalities</b> <input type="checkbox"/> Abnormal wall motion <input type="checkbox"/> Global hypokinesia			<b>TYPES OF CARDIOMYOPATHY</b> <input type="checkbox"/> Hypertrophic <input type="checkbox"/> Apical hypertrophic <input type="checkbox"/> Restrictive <input type="checkbox"/> ARVD <input type="checkbox"/> Dilated <input type="checkbox"/> Noncompaction <input type="checkbox"/> Takotsubo (stress induced)		<b>PERICARDIAL AND PLEURAL DISEASES</b> <input type="checkbox"/> Pericardial effusion without tamponade <input type="checkbox"/> Tamponade <input type="checkbox"/> Pericardial mass or hemopericardium <input type="checkbox"/> Pericardial constriction <input type="checkbox"/> Pericardial cyst <input type="checkbox"/> Pleural effusion																																																	
<table border="1"> <thead> <tr> <th></th> <th>Anterior</th> <th>Septal</th> <th>Lateral</th> <th>Inferior/Posterior</th> <th>Apical</th> </tr> </thead> <tbody> <tr> <td>Hypokinesia</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Akinesia</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Thinning and/or scar</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Aneurysm</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Pseudoaneurysm</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Ischemia (with stress testing)</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Viability (with stress testing)</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>						Anterior	Septal	Lateral	Inferior/Posterior	Apical	Hypokinesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Akinesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Thinning and/or scar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Aneurysm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pseudoaneurysm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ischemia (with stress testing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Viability (with stress testing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>SYSTEMIC DISEASE</b> <input type="checkbox"/> Amyloid <input type="checkbox"/> Hypereosinophilia		<b>CONGENITAL HEART DISEASE</b> <input type="checkbox"/> Patent foramen ovale <input type="checkbox"/> Primum ASD <input type="checkbox"/> Secundum ASD <input type="checkbox"/> Sinus venosus ASD <input type="checkbox"/> Muscular VSD <input type="checkbox"/> Membranous VSD <input type="checkbox"/> Supracristal VSD <input type="checkbox"/> Patent ductus arteriosus <input type="checkbox"/> Subaortic stenosis <input type="checkbox"/> Anomalous coronary artery <input type="checkbox"/> Coronary fistula <input type="checkbox"/> Tetralogy of Fallot <input type="checkbox"/> Ebstein's anomaly <input type="checkbox"/> Complete transposition (D-TGA) <input type="checkbox"/> Corrected transposition (L-TGA)	
	Anterior	Septal	Lateral	Inferior/Posterior	Apical																																																			
Hypokinesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																																			
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<b>VALVULAR HEART DISEASE</b>					<b>PULMONARY DISEASE</b> <input type="checkbox"/> Findings consistent with acute pulmonary embolism <input type="checkbox"/> Findings consistent with pulmonary hypertension		<b>DISEASES OF THE AORTA</b> <input type="checkbox"/> Marfan syndrome <input type="checkbox"/> Type A dissection <input type="checkbox"/> Type B dissection <input type="checkbox"/> Intramural hematoma <input type="checkbox"/> Aortic ulcer <input type="checkbox"/> Aortic enlargement or aneurysm <input type="checkbox"/> Aortic rupture <input type="checkbox"/> Sinus of Valsalva aneurysm <input type="checkbox"/> Sinus of Valsalva rupture <input type="checkbox"/> Coarctation																																																	
<b>Mitral Valve Structure</b> <input type="checkbox"/> Calcified <input type="checkbox"/> Rheumatic <input type="checkbox"/> Cleft <input type="checkbox"/> Vegetation <input type="checkbox"/> Prolapse <input type="checkbox"/> Flail <input type="checkbox"/> Fibroelastoma <input type="checkbox"/> Systolic anterior motion (SAM)					<b>Aortic Valve Structure</b> <input type="checkbox"/> Calcified <input type="checkbox"/> Rheumatic <input type="checkbox"/> Bicuspid <input type="checkbox"/> Vegetation <input type="checkbox"/> Flail <input type="checkbox"/> Fibroelastoma <input type="checkbox"/> Abscess		<b>Prosthetic Valve Present</b> <input type="checkbox"/> Normal function (includes normal gradients and closing jets) <input type="checkbox"/> Pathologic regurgitation <input type="checkbox"/> Perivalvular regurgitation <input type="checkbox"/> Elevated gradients <input type="checkbox"/> Obstruction due to thrombus or pannus <input type="checkbox"/> Dehiscence <input type="checkbox"/> Prosthetic valve endocarditis		<b>Pulmonic Valve Structure</b> <input type="checkbox"/> Congenitally abnormal <input type="checkbox"/> Carcinoid		<b>Tricuspid Valve Structure</b> <input type="checkbox"/> Fails to coapt <input type="checkbox"/> Carcinoid <input type="checkbox"/> Vegetation <input type="checkbox"/> Prolapse <input type="checkbox"/> Flail																																													
<b>Function</b>					<b>FUNCTION</b>																																																			
	Aortic Valve Stenosis	Mitral Valve Stenosis	Tricuspid Valve Stenosis	Pulmonic Valve Stenosis	Aortic Valve Regurgitation	Mitral Valve Regurgitation	Tricuspid Valve Regurgitation	Pulmonic Valve Regurgitation																																																
Mild/Moderate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																
Severe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																

**CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION  
ELECTROCARDIOGRAMS AND IMAGING STUDIES  
SAMPLE CASES**

**SCORING OF SAMPLE CASES**

**Angiogram:** This example shows coronary angiography of the left and right coronary systems. The images show >75% narrowing in the left anterior descending artery, and otherwise mild disease (<50%). The correct selections for this case are insignificant stenosis of the left circumflex coronary artery AND insignificant stenosis of the right coronary artery AND severe stenosis of the left anterior descending coronary artery. You must select all three answer choices to receive a correct score for this case. Below is the appearance of the answer option list with the correct answers selected.

**Angiogram Sample Case: A 50-year-old man who has chest pain with minimal exertion**

Figure/Media

**NOTE: You must select a description for the degree of the most severe stenosis in each diseased vessel shown.**

Normal

	Left main	Left anterior descending	Left circumflex	Right	Bypass graft
Fixed stenosis:					
Insignificant stenosis (<50% diameter reduction)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Moderate stenosis (50 to 75% diameter reduction)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe stenosis (>75% diameter reduction)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total occlusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Filled by collaterals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spasm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thrombus present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Myocardial bridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anomalous origin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coronary fistula	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aneurysm/Severe ectasia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bypass graft to (indicate observed anatomical connection)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dissection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stent: patent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stent: occluded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>